

## REMARKS

Claims 1 and 7 have been amended, New claims 10-12 have been added. Thus, claims 1-12 are presented for examination. Support for the amendment to claim 1 may be found in the specification, for example, at page 10, line 26 to page 11, line 25. Support new claims 10-12 may be found in the specification at page 11, lines 4-7; page 12, lines 16-21; and page 13, line 26 to page 14, line 4, respectively. Thus, no new matter has been added.

### Rejection under 35 U.S.C. §103(a)

#### **Bassett et al. (US 5,145,763) in view of Mizuta et al. (US 6,869,742)**

Claims 1-9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Bassett et al. (US 5,145,763) in view of Mizuta et al. (US 6,869,742). The Examiner stated that it would have been *prima facie* obvious to substitute the novolak resin in Mizuta et al. as the photosensitive novolak resin in Bassett et al. and reasonably expect the same or similar results as disclosed in Bassett et al. (high resolution, sensitivity and definition). However, as explained below, this combination of references would not render the claimed invention obvious.

Establishing *prima facie* obviousness requires a showing that each claim element is taught or suggested by the prior art. *See, e.g., In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580. (CCPA 1974). Claim 1 as amended recites that one of the components of the positive resist composition is (C) an alkali soluble acrylate resin. This claim element is neither disclosed nor suggested by either of the cited references. Thus, Claim 1 cannot be *prima facie* obvious over the cited combination of references.

In addition, the inclusion of an alkali soluble acrylate resin provides unexpected advantages that could not have been inferred from the teachings of the cited references. In particular, the alkali soluble acrylic resin improves anti-plating properties, such as preventing generation of cracks, when forming a thick film resist layer and applying a plating thereto (see present specification at p. 10, line 27 to page 11, line 1).

Moreover, the positive photoresist composition formed by dissolving components (A) and (C) in organic solvent (B) provides other unexpected advantages that could not have been predicted based on the cited references. As described in the background section of the specification, when a thick film manufacturing process is needed, a resist pattern must be formed with sufficient perpendicularity, at a high sensitivity and with a high development velocity under,

for example, thick film conditions of 3  $\mu\text{m}$  or more. However, it is difficult to satisfy the requirement under such thick film conditions using conventional positive photoresist compositions.

Positive photoresist compositions which comprise a photosensitive novolak resin formed from an alkali-soluble novolak resin wherein some hydrogen atoms within those of all phenolic hydroxyl groups of the resin are substituted by 1,2-naphthoquinone diazide sulfonyl groups are known as materials suitable for the exposure process under thick film conditions. However, according to research by the present inventors, although the positive photoresist composition comprising a photosensitive novolak resin formed from an alkali-soluble novolak resin wherein some hydrogen atoms within those of all phenolic hydroxyl groups of the alkali-soluble novolak resin are substituted by 1,2-naphthoquinone diazide sulfonyl groups is suitable for realizing the perpendicularity and high sensitivity of a resist pattern in a thick film, the development velocity of the composition is slow.

In this situation, the present inventors have made extensive and intensive studies with an object of developing a positive photoresist composition particularly suitable for forming a thick resist pattern, which can realize not only perpendicularity and high sensitivity under thick film conditions of 3  $\mu\text{m}$  or more, but also has a high development velocity. This object can be achieved by the method recited in amended Claim 1 in which a positive photoresist composition is formed by dissolving components (A) and (C) in organic solvent (B).

In the present invention, by using a 1,2-naphthoquinone diazide sulfonyl-substituted novolak resin having a degree of dispersion of 2.2 to 2.8, the resolvability, the perpendicularity of a resist pattern, and the heat resistance of the positive photoresist composition are improved (see present specification at p.8, lines 13-15).

Further, by using propylene glycol alkyl ether acetate as the (B) component, the dissolution rate can be increased, without causing thickness loss of the non-exposed part by development. Furthermore, development velocity can be increased, while maintaining the effect by the (A) component, i.e., good sensitivity and perpendicularity of the resist pattern form (see p.9, lines 5-10 of the present specification).

Furthermore, the positive photoresist composition of the present invention contains an alkali soluble acrylate resin (C) as a plasticizer. This component (C) improves anti-plating property, such as preventing generation of cracks, when forming a thick film resist layer and applying a plating thereto (see present specification at p.10, lines 27 to p.11, line 1).

Neither Bassett nor Mizuta teach or suggest the positive photoresist composition formed as recited in amended Claim 1. Furthermore, neither Bassett nor Mizuta teach or suggest the beneficial effects of component (A) (improvement of resolvability, perpendicularity of a resist pattern, and heat resistance of the positive photoresist composition), component (B) (i.e., improvement of dissolution rate without causing thickness loss of the non-exposed part by development; improvement of development velocity while maintaining good sensitivity and perpendicularity of the resist pattern form) and component (C) (improvement of anti-plating property when forming a thick film resist layer and applying a plating thereto). Lastly, neither Bassett nor Mizuta teach or suggest the beneficial effects of the present invention (i.e., high development velocity under thick film conditions of 3  $\mu\text{m}$  or more, as well as perpendicularity and high sensitivity under thick film conditions of 3  $\mu\text{m}$  or more). These unexpected advantages could not have been predicted based on the disclosures of Bassett and/or Mizuta.

**Okazaki et al. (US 5,422,221) in view of Nishi et al. (5,759,736) and Mizuta et al.**

Claims 1-9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al. (US 5,422,221) in view of Nishi et al. (5,759,736) and Mizuta et al. Mizuta et al. is discussed above. The Examiner stated that it would have been *prima facie* obvious to use a mixture of ethyl lactate and polypropylene glycol monomethyl ether acetate to dissolve the components of Okazaki et al. and reasonably expect same or similar results with respect to smooth coating properties and excellent storage stability. The Examiner alleges that it would also have been *prima facie* obvious to substitute the novolak resin in Mizuta as the photosensitive resin in Bassett and reasonably expect same or similar results as disclosed in Bassett. However, as explained below, this combination of references would not render the claimed invention obvious.

Claim 1 as amended recites that one of the components of the positive resist composition is (C) an alkali soluble acrylate resin. This claim element is neither disclosed nor suggested by any of Okazaki, Nishi or Mizuta. Thus, Claim 1 cannot be *prima facie* obvious over the cited combination of references.

In addition, as discussed above, the inclusion of an alkali soluble acrylate resin provides unexpected advantages that could not have been inferred from the teachings of the cited references. In particular, the alkali soluble acrylic resin improves anti-plating property, such as preventing generation of cracks, when forming a thick film resist layer and applying a plating thereto (see present specification at p. 10, line 27 to page 11, line 1). The comments provided

above regarding the additional unexpected advantages of a positive photoresist composition formed by dissolving components (A) and (C) in organic solvent (B) as presently claimed are also applicable to this rejection. These advantages could not have been predicted based on the cited references.

In view of the amendments and comments presented above, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §103(a).

### CONCLUSION

Applicants submit that all Claims are in condition for allowance. If minor matters remain that could be resolved by teleconference, the Examiner is invited to contact the undersigned at the telephone number provided below. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 4/24/07

By: 

Neil S. Bartfeld, Ph.D.  
Registration No. 39,901  
Agent of Record  
Customer No. 20,995  
(619) 235-8550

3643500  
041207